



Federal Energy Management Program

Leading by example,  
saving energy and  
taxpayer dollars in  
federal facilities

**ESET**  
ENERGY SAVINGS  
EXPERT TEAMS

## Energy Savings Expert Teams

FY 2006 Summary Report

*February 28, 2006*



U.S. Department of Energy

**Energy Efficiency  
and Renewable Energy**

Bringing you a prosperous future where energy  
is clean, abundant, reliable, and affordable

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## Background

On September 26, 2005, in an effort to lead by example and further contribute to the relief effort, the President directed “heads of executive departments and agencies to take appropriate actions to conserve energy and fuel use at their facilities to the maximum extent consistent with the effective discharge of public responsibilities.”

In response to the President’s call for action, DOE’s Federal Energy Management Program (FEMP), redirected resources and personnel to send trained energy savings expert teams (ESET) to federal sites where large amounts of natural gas are consumed, and where the effects of the hurricane on natural gas supplies or prices were most severe.

In the first quarter of FY 2006, FEMP ESET teams visited 28 federal sites to identify short-term, low-cost ways to help alleviate the effects of tight natural gas supplies and significantly higher prices. This report provides a summary of the findings of the site visits.

## Site Selection

FEMP selected sites with a strong focus on natural gas consumption, agency support, and availability of an on-site energy champion. Selection was also influenced by time constraints and the need to use the existing FEMP budget. Several of the site assessments support other FEMP program objectives, such as those for Utility Energy Savings Contracts or Industrial Site Assessments.

FEMP identified more than 70 potential sites after notifying the DOE FEMP Regional Offices, the Interagency Task Force, and the national laboratories of the intent to offer the assessments. A screening and prioritizing process was employed to finalize the selection of 28 sites. Agencies that participated in the ESET activity included the Federal Bureau of Prisons; U.S. Coast Guard; Department of Defense Air Force, Army, and Navy bases; Department of Energy; Department of the Interior, National Park Service; Food and Drug Administration; General Services Administration; Health and Human Services; National Aeronautics and Space Administration; and the Veterans Administration.

## ESET Teamwork

The ESET teams included professional engineers, energy managers, and facilities managers with collective expertise in a broad range of building energy efficiency technologies and operations and maintenance procedures. FEMP provided training for all team members so that each team would be conducting assessments according to a common technical protocol and reporting format.

Prior to each visit, the team conducted interviews with the appropriate site staff to gather information about specific site needs and desired outcomes, and to ascertain what resources or expertise might be needed by the teams upon arrival. ESET team objectives included the following:

- Identify low-cost, short-term measures that could provide immediate or short-term savings in natural gas;
- Provide recommendations for operations and maintenance improvements that could lead to more lasting reductions in demand for natural gas; and
- Identify longer-term projects that the site could implement as funding allows and time permits.

The teams worked closely with site staff to conduct site assessments that generally lasted two to four days. With the primary focus on natural gas systems, the teams identified no-cost and low-cost measures that could be undertaken by the site staff. FEMP provided training to teams and in some cases to site personnel, on the assessment protocols to review boiler operations, steam, and hot water distribution systems; automated controls; heating, ventilating, and air-conditioning (HVAC) systems; and lighting systems.

Nineteen ESET teams assessed 28 sites between October 27 and December 21<sup>t</sup>, 2005. In preparation for site visits, preliminary information was obtained from the sites, and tracking procedures and protocols for assessment and reporting were developed and implemented. With a strong team approach, FEMP exceeded its goal to complete 25 site visits by December 31, 2005.

The ESET teams were drawn from the following organizations:

- Department of Energy, FEMP - Ab Ream, FEMP ESET Project Manager; Brad Gustafson; Tatiana Strajnic; Shawn Herrera; Bev Dyer; Anne Crawley; Randy Jones; David McAndrew
- Department of Energy Laboratories
  - Pacific Northwest National Laboratory
  - Lawrence Berkeley National Laboratory
  - National Renewable Energy Laboratory
  - Oak Ridge National Laboratory
- Private sector
  - Enviro Management & Research (EMR)
  - Washington Gas – PAX River Naval Base utility partner
  - DTE Energy – VAMC Detroit utility partner
- Industrial Assessment Center (IAC)
  - University of Chicago
- SAVEnergy Contractor (SEC)
  - Celtic Energy
  - Simon & Associates
  - EMC Engineers

The primary consideration in team deployment was the match of team expertise and experience with site needs. Teams were generally made up of FEMP and laboratory staff; laboratories with utility, agency, and private sector partners; private sector, SAVEnergy contractors, and Industrial Assessment Centers. Existing FEMP support activities were also a consideration in team selection to allow site visits to support multiple FEMP support activities. Finally, site location was also considered; all other factors being equal, FEMP mobilized teams that would require the lowest travel expenses.

## Results and Implications

Teams focused primarily on natural gas use and secondarily on electrical use to identify efficiency and conservation measures that will reduce consumption as shown in Table 1.

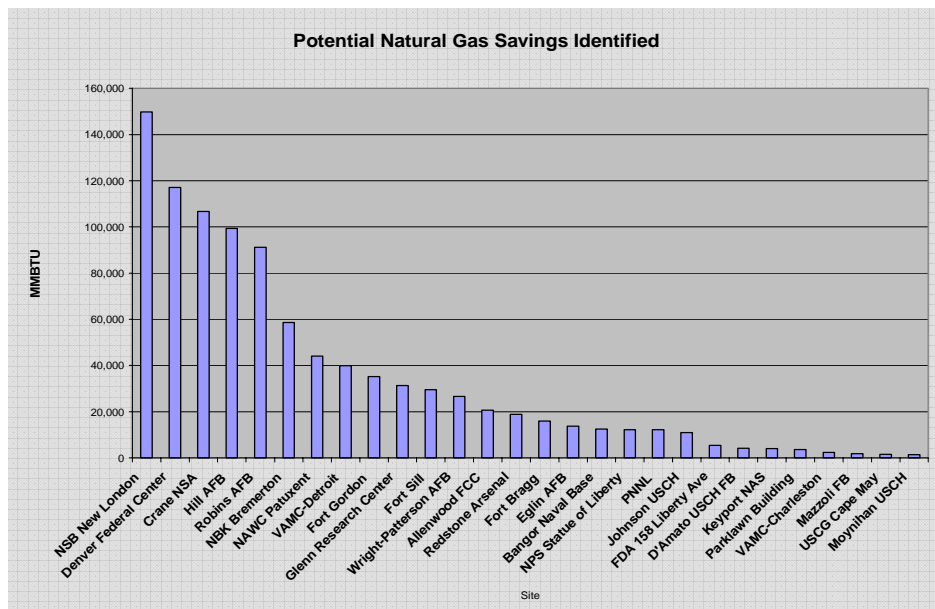
**Table 1. Estimated potential energy savings**

ESET 2006 Phase I - Annual Consumption & Estimated Potential Savings (MMBtu)						
# of sites	Agency	Site	Natural Gas Consumption	Natural Gas Savings	Electricity Consumption	Electricity Savings
1	BOP	Allenwood FCC	177,385	20,708	108,810	10,211
2	DHS	USCG Cape May	112,000	1,477	41,120	691
3	DOD	Eglin AFB	451,215	13,666	887,372	0
4	DOD	Hill AFB	1,283,121	99,290	914,089	4,101
5	DOD	Robins AFB	1,016,397	91,180	1,121,909	12,400
6	DOD	Wright-Patterson AFB	512,661	26,593	1,398,000	99
7	DOD	Fort Bragg	1,597,610	16,002	1,873,834	0
8	DOD	Fort Gordon	371,958	35,200	152,186	1,702
9	DOD	Fort Sill	658,240	29,473	592,247	14,890
10	DOD	Redstone Arsenal	300,017	18,844	751,130	7,511
11	DOD	Bangor Naval Base	404,929	12,556	564,556	0
12	DOD	Bremerton Naval Shipyard	939,000	58,690	97,928	0
13	DOD	Crane NSA	487,140	106,723	486,883	35
14	DOD	Keyport NAS	113,054	4,032	85,918	0
15	DOD	NAWC Patuxent	367,418	44,080	608,692	5,448
16	DOD	NSB New London	728,211	149,795	298,910	58,862
17	DOE	PNNL	85,191	12,225	230,043	0
18	DOI	NPS Statue of Liberty	30,724	12,272	38,990	9,343
19	HHS	FDA 158 Liberty Ave	38,000	5,368	35,238	9,105
20	GSA	D'Amato USCH FB	34,790	4,175	47,610	3,875
21	GSA	Moynihan USCH	24,998	1,368	47,493	7,689
22	GSA	Denver Federal Center	385,892	117,037	129,464	863
23	GSA	Johnson USCH	18,023	10,943	24,425	10,907
24	GSA	Mazzoli FB	6,186	1,755	27,984	2,555
25	HHS	Parklawn Building	23,639	3,709	67,257	8,100
26	NASA	Glenn Research Center	511,567	31,253	656,294	0
27	VA	VAMC-Detroit	222,427	39,940	111,236	14,172
28	VA	VAMC-Charleston	38,218	2,410	47,978	1,095
<b>Totals</b>			<b>10,940,011</b>	<b>970,764</b>	<b>11,447,596</b>	<b>183,654</b>

Estimated potential savings from the recommended efficiency improvement measures, averaged for the 28 sites, include the following:

- Potential natural gas savings – 9.4% of the total consumption of all sites assessed
- Potential natural gas cost savings - \$6,659,441 (2004 Preliminary Report – average natural gas cost in FY 2004 was \$6.86/MMBtu)
- Potential electrical savings – 1.8% of the total consumption of all sites assessed<sup>1</sup>
- Potential electricity cost savings - \$3,577,580 (2004 Preliminary Report – average electricity cost in FY 2004 was \$19.48/MMBtu)
- The cost to implement the identified low-cost measures of the combined 28 sites is \$8,002,447 / 987,412MMBtu or approximately \$8.10/MMBtu saved. (Low-cost measures were defined as less than \$20,000 and/or less than 2 year simple payback.)
- Total square footage of facilities assessed = 172,748,959
- The percent of the federal natural gas load represented by these assessments is approximately 9% based on 105,418,800 MMBtu standard buildings natural gas consumption.<sup>2</sup>

The types of recommendations and the resulting natural gas savings in million British thermal units (MMBtu) savings from the 28 site assessments are illustrated in Figure 1. Figure 2 shows the potential savings in natural gas as a percentage of the total consumption at each site.



**Figure 1. Potential natural gas savings identified at each site**

<sup>1</sup> While the primary focus of site visits was natural gas, the teams found some obvious opportunities for electricity savings and noted those opportunities in their site reports.

<sup>2</sup> DOE/FEMP Preliminary Annual Report for FY04, Table 4.

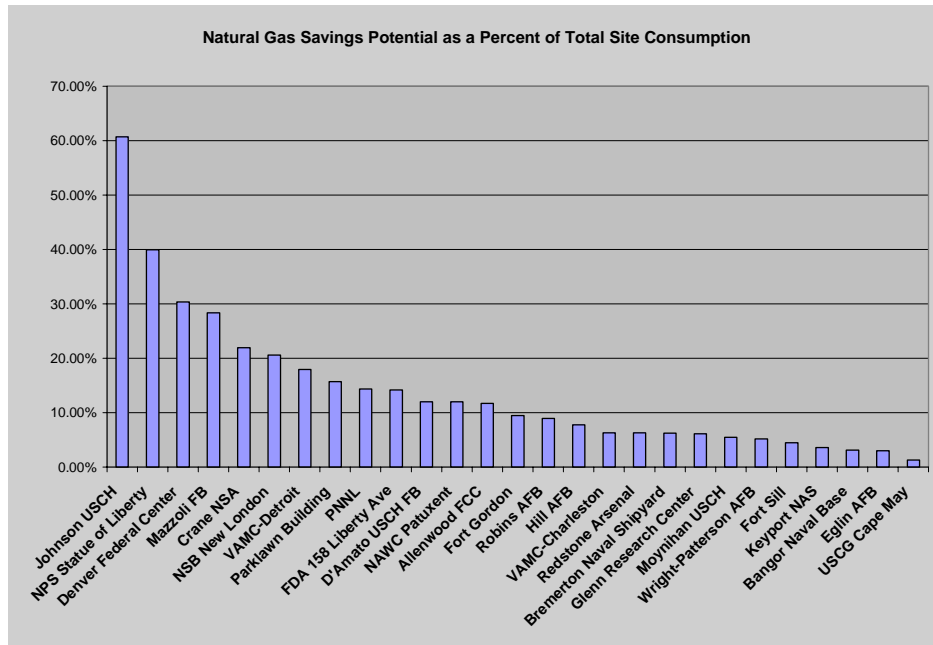


Figure 2. Natural gas savings potential as a percentage of total consumption

Since boilers are big users of natural gas, boiler efficiency, steam trap, and distribution line failures and boiler controls were a high priority for assessments. The teams also performed limited assessments of other capital-intensive energy efficiency measures at the sites.

The teams focused primarily on identifying opportunities to reduce natural gas use through low-cost and no-cost operational efficiency measures. Figure 3 shows the identified potential natural gas savings by energy conservation measure (ECM) type.

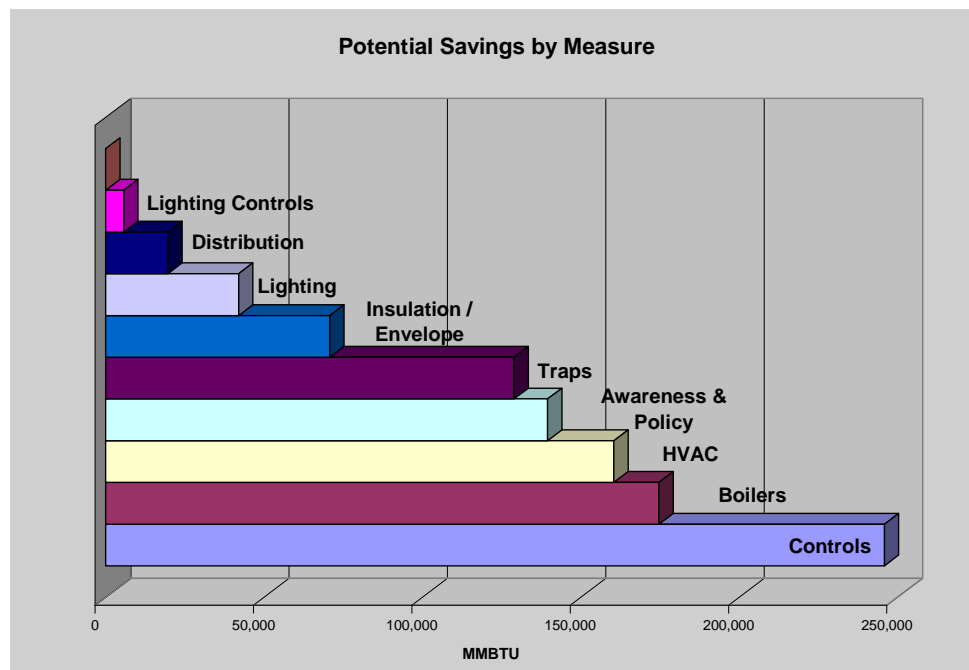
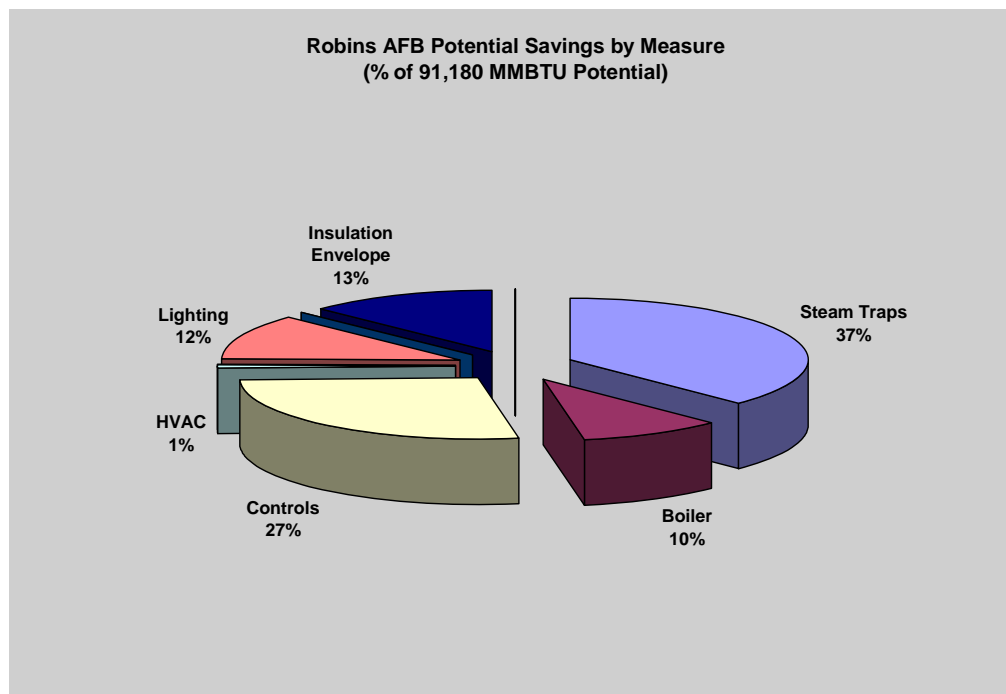


Figure 3. ECM type and the resulting MMBtu savings identified

The findings are consistent with the high numbers of recommendations for controls, boiler efficiency, steam trap maintenance, insulation, and distribution line measures. To illustrate the potential impact of recommended improvements at the site level, Figure 4 depicts the savings opportunities identified at Robins Air Force Base.



**Figure 4. Robins Air Force Base potential natural gas savings shown by ECM type**

A careful assessment can almost always find improvements even in a well-run building. We were informed the day before we arrived in Charleston that the VAMC had been designated an Energy Star building a few years ago, and our experience was that the facilities staff were very knowledgeable and they had advanced equipment (e.g., ice storage) to help them run efficiently. We nonetheless were able to find 19 no/low cost measures that will save over 3,500 MMBtu—more than 5% of consumption—and identified 12 capital-intensive measures that will save them additional energy if implemented.

*- Charles Williams  
Lawrence Berkeley National Laboratory*

As time permitted, the teams assessed the potential for higher-cost, capital-intensive measures to support site planning efforts, but without expectations for their implementation in the short-term.

Low-cost and no-cost measures are expected to be implemented during the site visit or shortly thereafter. FEMP plans to follow-up with each site to maximize realized savings and to help sites with the completion of all remaining low- and no-cost measures and to help with project development for the more capital-intensive measures.

## Potential for Contributing to Federal Energy Goals

These findings, and the findings of similar efforts by FEMP over the past five years, strongly suggest that similar opportunities exist to improve operational efficiency at many federal sites. In many cases, operational efficiency can be achieved through low-cost operations and maintenance methods, or, provided that resources are available, for longer term, more capital-intensive projects. The large numbers of no- and low-cost measures identified show that the very modest commitment of resources required to implement these measures could yield a return of \$1,082,619 in annual cost savings. The findings also bear out estimates of at least 10% potential savings through building tune-ups even higher savings through the use of more comprehensive retro-commissioning activities that focus more on improving performance of existing equipment than investing in retrofit projects. Considering that federal agencies reduced site energy consumption by 21.7% between 1985 and 2000, largely through investment in retrofits, increased emphasis on operations and maintenance efficiency can lead to even higher performance.

The 28 sites visited by ESET teams represent almost 9% of the federal natural gas consumption and can be considered a fairly significant sample size. If all federal agencies implemented similar efficiency improvements across the board, we would see a significant contribution to our energy reduction goals.

## Follow On Plans

The Department of Energy Federal Energy Management Program is following up with the 28 ESET sites to ensure that the potential of the recommendations can be fulfilled. The objective is to work with site management to identify the resources needed to take action on recommendations made but not implemented during site assessments. FEMP also plans work with the agencies to further develop the more capital-intensive, longer term projects identified during the site visits.

## ESET Activities for the Remainder of FY 2006

Hurricanes Katrina and Rita have heightened the focus on natural gas supply and price volatility. Peak loads may no longer be causing emergencies as we complete this report, but remain a factor in areas with transmission constraints. And another season of severe hurricane activity could provide a re-run of the summer/fall of 2005. Containment of energy consumption and costs continues to be a high priority as sites feel the repercussions of ongoing rate increases. The need to improve operational efficiencies is obvious and most noticeable by the growing list of ESET candidates sent to FEMP by agencies.



Accordingly, the second half of FY 2006 FEMP ESET teams will focus on the following:

- Reducing natural gas consumption through identification and implementation of no-cost and low-cost operational measures;
- Identifying public benefits funding and alternative tariffs; and
- Identifying other FEMP support services desired by federal sites.

In addition to site assessments, FEMP ESET activities during the remainder of FY 2006 will include the following:

- Tracking and reporting of progress;
- Follow-up activities for ESET sites, such as developing UESCs or ESPCs; and
- Completion of 8-10 additional site visits and reports.

## Conclusions and Recommendations

The following conclusions and recommendations can be made regarding the overall outcome of this effort:

- There is significant opportunity at federal sites for improvements in the operations and maintenance of natural gas systems, with major opportunities in boiler re-tuning, improvements in controls systems, and identification and repair of steam leaks.
- There is also significant opportunity to develop more and better energy efficiency training and awareness programs for building operators and facilities managers.
- FEMP should focus on these areas in future efforts to have the greatest impact on federal energy efficiency.
- ESET should evolve into more comprehensive retro-commissioning activities so that energy and cost savings will be more sustainable.

### A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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